CAIT

Center for Advanced Infrastructure & Transportation
Rutgers, The State University of New Jersey

QUARTERLY PROGRESS REPORT

Project Title:	Concrete Shrinkage Analysis for Bridge Deck Concrete
RFP NUMBER: 2005-04	NJDOT RESEARCH PROJECT MANAGER: Anthony Chmiel
TASK ORDER NUMBER: TO 180 / RU Acct 4-26545	PRINCIPAL INVESTIGATOR: Dr. Husam Najm
Project Starting Date: 1/1/2006 **Original** Project Ending Date: 12/31/2006 **Modified Completion Date: 6/30/2007**	Period Covered: 1st Quarter 2007

Task #	Task	% of Total	Fixed Budget	% of Task this quarter	Cost this quarter	% of Task to date	Total cost to date
1	Mobilization	15.0%	$ 22,000.00	15.0%	$ 3,300	100.0%	$ 22,000
2	Literature Search	4.0%	$ 6,000.00	5.0%	$ 300	88.0%	$ 5,280
3	Identify all NJDOT mixes used in decks and those that exhibited cracking	7.0%	$ 10,000.00	15.0%	$ 1,500	85.0%	$ 8,500
4	Prepare mixes and perform AASHTO PP34-99 test on each mix	32.0%	$ 47,290.00	25.0%	$ 11,823	87.0%	$ 41,142
5	Prepare a list of cracking potential for each mix	3.0%	$ 4,500.00	20.0%	$ 900	50.0%	$ 2,250
6		0.0%	$ -	0.0%	$ -	0.0%	$ -
7		0.0%	$ -	0.0%	$ -	0.0%	$ -
8		0.0%	$ -	0.0%	$ -	0.0%	$ -
9		0.0%	$ -	0.0%	$ -	0.0%	$ -
10		0.0%	$ -	0.0%	$ -	0.0%	$ -
11		0.0%	$ -	0.0%	$ -	0.0%	$ -
12		0.0%	$ -	0.0%	$ -	0.0%	$ -
13		0.0%	$ -	0.0%	$ -	0.0%	$ -
14		0.0%	$ -	0.0%	$ -	0.0%	$ -
15		0.0%	$ -	0.0%	$ -	0.0%	$ -
16		0.0%	$ -	0.0%	$ -	0.0%	$ -
17		0.0%	$ -	0.0%	$ -	0.0%	$ -
18		0.0%	$ -	0.0%	$ -	0.0%	$ -
19		0.0%	$ -	0.0%	$ -	0.0%	$ -
20	Final Report and Quarterly Reporting	39.0%	$ 58,906.00	20.0%	$ 11,781	62.0%	$ 36,522
	TOTAL	100.0%	$ 148,696		$ 29,604		$ 115,694

Blue text is entered once at the beginning of the project

Green text is updated ever quarter

Black text is automatically updated or static

Project Objectives:

The objectives of this study are to: 1) Evaluate the shrinkage potential properties of concrete mixes which are currently being used for bridge deck applications in New Jersey using the AASHTO PP 34-99 test method and 2) Provide a list of all tested mixes from the lowest cracking potential to the highest.

Project Abstract:

For many years, scientists and engineers have been improving on the development of concrete technology. Concrete is no longer a simple material that only includes cement, water, and aggregates but a more involved mixture. Many pozzolanic materials (such as silica fume, and fly ash) and chemical admixtures (such as superplasticizers and air entraining agent) are being added to improve the quality of the concrete. However, there is a concern the compressive strength no longer constitutes the only criterion in specifying the concrete, but other factors, such as shrinkage and durability, become more pronounced. HPC has been developed to highlight the durability of concrete. Technical specifications have been developed to ensure the best performance of High Performance Concrete (HPC). However, it has been observed by State Engineers that many bridge decks are exhibiting cracking soon after being poured. A test has been developed by AASHTO (PP 34-99, The Passive or Restrained Ring Test) that measures the cracking potential of a concrete mix. This cracking tendency test needs to be performed on all NJDOT current and experimental mixes used for bridge decks to identify those mixes that exhibit high cracking tendencies.

1. Progress this quarter by task:

• There were 4-mixes to be made after the Quarterly Report meeting on Jan 29th. These mixes were made and an additional mix R308278 was repeated due to inconclusive results obtained from the VSWG
• Mix R309494 had a slump of more than 10 in. The mix was tried again and the mix still has more than 10 in slump.
• For mix R200578S, the slump with the mix design was 10 in. On the second trial, the water amount was reduced and the slump was reduced to 8.5 in.
• Work on analyzing data from the previous mixes has begun. When these mixes reach 56 days, comparisons will be made the previous 12 mixes.
• Mix R311266 has much lower 28 day compressive strength than its design strength. Also, mix R309494 was tried 3 times and slump specification was never met. If more material shipment can be arranged, remixing these mixes could be possible.

2. Proposed activities for next quarter by task:

• Data on all mixes will be collected and finalized

• Performance of the mixes will be compared according to their cementitious content and w/c ratio (as discussed in the quarterly meeting).
• Potential of shrinkage will be defined and all mixes will be rated in terms of performance according to their respective potentials.
• Free shrinkage and restrained shrinkage results will be compared to suggest a limit value for free shrinkage to minimize the potential for restrained shrinkage cracking

3. List of deliverables provided in this quarter by task (product date):

- **Results from the 4-mixes that were made in this quarter.**
- **Results from 56 days and 91 days with visual observations and graphical results. of shrinkage tests and other tests already performed on the complied mixes with comparisons.**

4. Progress on Implementation and Training Activities:

5. Problems/Proposed Solutions:

Total Project Budget	$148,696
Modified Contract Amount:	
Total Project Expenditure to date	$115,694
% of Total Project Budget Expended	77.81 %

NJDOT Research Project Manager Concurrence: _____ Date: _____